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FROM Theresa A. Lober

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RE:
Applicants: **Hung et al.**
Serial No.: **10/015,732**
Docket No. **MIT8178CONT**
Filed: **December 10, 2001**
For: **Electrostatically-Controllable Diffraction Grating**

MESSAGE

Please deliver the attached proposed response to Examiner Addison.
Thanks very much.

If there is a problem with this transmission, please call Theresa Lober at 978 369 2181.

Docket No. MIT8178CONT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Hung et al.
Serial No.: 10/015,732
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For: Electrostatically-Controllable Diffraction Grating

Examiner: K. Addison
Art Unit: 2834

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I hereby certify that this correspondence is being transmitted by facsimile on the date given below to Examiner Addison's personal facsimile number: 703-746-4164

May 14, 2003
Thelma A. Lee

RESPONSE

This response is made in reply to the Examiner's Action mailed March 12, 2003. This response is made within the three-month period for reply set in the Action.

Examiner Addison is thanked for conducting a telephone interview with the undersigned Agent on Monday May 12, 2003. During the interview, a proposed response, the content of which is substantially that of this response, was discussed, and the undersigned Agent presented evidence that the grating element shown in Fig. 22 of the instant application is provided by the invention. The Examiner agreed to this position during the interview.

In the Office Action mailed March 12, 2003, Examiner Addison rejected claims 1, 4-7, 9-12, and 14-19 of the instant application over U.S. patent No. 5,757,536 to Ricco. The Examiner suggested that Fig. 22 of the instant application was taken from or refers to a figure in the Ricco patent. As explained by the undersigned Agent and agreed by Examiner Addison during the telephone interview, this is not the case.

Fig. 22 is a cross-sectional side view of a diffraction grating element provided by the invention, not provided by the Ricco patent. There can be no other interpretation of this figure.

The following points in the instant Specification make this clear:

Page 9, lines 20-23 states as follows:

> "Fig. 21 is a schematic side-view diagram of an electrically-programmable diffraction grating provided by the invention.
> Fig. 22 is a schematic side-view diagram of a portion of one row of grating elements in the diffraction grating of Fig. 21."

In other words, Fig. 22 is a view of one of the grating elements shown in Fig. 21, provided by the invention, not taken from a prior patent. This correspondence between Fig. 22 and Fig. 21 is made very clear in the specific description of the grating element on Page 49, lines 19+ +, where it is stated that "[r]eferring also back to Fig. 21, this configuration provides an arrangement wherein each mirror beam row 230, Fig. 22, corresponds to one of the electrostatically programmable mirrors in the mirror array 182, Fig. 21."

It is also made clear that the element of Fig. 22 is provided by the invention in that a simplified version of Fig. 22 is provided in Figs. 8A-8B. Figs. 8A-8B provide a configuration identical to that of Fig. 22, but for clarity, show only one mirror element 58 atop actuation elements 52, 54, in a simplified electrode configuration. In Fig. 22 there is shown a row of mirror elements 225, 226, atop a row of actuation elements 213, 214, with additional electrodes. The instant Specification states, on Page 7, lines 23-25, that "[f]igs. 8A-8B are diagrams of ...a double beam electrostatic actuation configuration provided by the invention. The double beam electrostatic actuation configuration of Figs. 8A-8B is the same as that implemented in the configuration of Fig. 22, and correspondingly is provided by the invention, not taken from a prior patent.

Page 46, lines 6++ of the instant application make clear that the diffraction grating of Fig. 21 and its grating element design, shown in Fig. 22, are provided by the invention, stating:

> "A wide range of applications are addressed by the electrostatic actuation structures provided by the invention...One such optical application that is addressed by the

invention is a programmable, optical diffraction grating 180, shown schematically in a cross-sectional view in Fig. 21."

The instant specification goes on to describe operation and capabilities of the diffraction grating of the invention, at Page 46, line 15 - Page 47, line 11, and then explains, on Page 47, lines 12++ that, "[t]hese capabilities of the diffraction grating of the invention are particularly well-suited for use in an electrostatically programmable polychromator system as contemplated by the invention." A polychromator system is then described in general, at Page 47, line 14 - Page 48, line 7. The instant Specification then indicates at Page 48, line 8 that "[s]pecific design and operational considerations for a polychromator system employing an electrostatically-programmable diffraction grating are presented in U.S. No. 5,757,536,...to Ricco et al...."

The Specification does not say that the Ricco patent presents a polychromator system employing the diffraction grating of the invention; the Specification says that the Ricco patent presents considerations for a polychromator system employing a diffraction grating, that is, considerations for any diffraction grating, in general, whether it be for that of the invention, that described in the Ricco patent itself, or another diffraction grating.

Then on Page 48, lines 13++, the instant Specification states that "Fig. 22 represents a schematic side view of an electrostatically programmable diffraction grating element that is integral to a diffraction grating provided by the invention for the Ricco polychromator system. In other words, the diffraction grating element of Fig. 22 is provided by the invention to be employed in a polychromator system like the one described in the Ricco patent. The diffraction grating element of Fig. 22 is not provided by the Ricco patent teachings; it is provided by the teaching of the instant application for use in the Ricco polychromator system.

Examiner Addison has listed the elements required by claim 1 and has asserted that claim 1 reads on the grating element of Fig. 22. Claim 1 indeed does read on Fig. 22 because Fig. 22 in fact illustrates the invention as claimed in claim 1.

Ricco does not teach or even suggest all of the required elements of the grating of the invention illustrated in Fig. 22 and required by claim 1. A comparison of a diffraction grating of the invention as claimed and as shown in Fig. 22 and Ricco's system, as shown, e.g., in Ricco Fig. 1, makes this clear.

As described in the Specification on Page 48, lines 13++ and recited in claim 1, in the grating element of the invention, as shown in Fig. 22, there are required interconnected actuation elements 213, 214 in a row 212 of elements. Each of these elements is suspended over a substrate 200 by a mechanically constrained support region 216a, 216b, 216c to define a vertical actuation gap between the element and the substrate. Each actuation element includes a conducting actuation region - in Fig. 22, the elements 213, 214 are conduction regions themselves. Element 204 is not a conducting region included in the actuation region connected to the support regions, as suggested by the Examiner; this is a substrate layer provided for making connection to a voltage source - it is not included in the actuation element in any way, and is not connected to the actuation support regions 216a, 216b, 216c as required by the claims. The Examiner references elements 218a-c as actuation support regions; this is not correct. The Examiner previously had correctly identified the support regions as elements 216a, 216b, 216c - they support the actuation element over the substrate to define a vertical actuation gap. Elements 218a, 218b, 218c are electrical ground pads on the substrate; they do not support the actuation element over the substrate to define a vertical actuation gap above the substrate.

The invention as claimed further requires that a mirror element 226 be provided for at least one actuation element 213. Element 230 referenced by the Examiner as a mirror element is actually the optically reflecting upper mirror surface of a mirror beam row required by the claims. The mirror element is vertically suspended over a corresponding actuation element 213 by mechanically constrained mirror support regions 228a, 228b connected to the actuation element to define a vertical mirror gap through which a mirror deflection region can be deflected. The mirror element 230 here itself includes a portion that can be deflected vertically through the vertical mirror gap. The Examiner identifies elements 208a-208e as mirror support regions. This

is not correct. Elements 208a-e are actuation electrodes on the substrate and being located on the substrate, and not mechanically connected in any way to the mirror element 226 or the actuation element 213, they could not and do not support the mirror element to define a vertical mirror gap. The Examiner here identifies elements 220a-b as the actuation elements. This is not correct. The Examiner had previously correctly identified elements 220a-b as substrate grounding electrodes. The actuation elements are elements 213, 214. The claims further require that the mirror element include a mirror deflection region; in the embodiment of Fig. 22 the mirror element itself provides a deflection region.

The claims require that the mirror gap of a mirror element be less than the actuation gap of a corresponding actuation element. This condition is explicitly defined in the beam illustration of Figs. 8A-8B. As shown in Fig. 8A, an actuation gap, g_0, is defined between an actuation element 54 and the substrate 14. A mirror gap, g_1, is defined between a mirror element 58 and the actuation element 54. Fig. 8A illustrates a beam in an un-actuated state. As the actuation element is actuated, the actuation element bends toward the substrate, in the manner shown in Fig. 8B. Fig. 22 illustrates a beam as-actuated, in the same condition as that of Fig. 8B; the actuation elements 213, 214 have been actuated toward the substrate. In her remarks, the Examiner has identified element g_0 as a vertical mirror gap and element g_1 as a vertical actuation gap; this is not correct. As shown in the figures, the gap g_0 refers to the actuation gap, and the gap g_1 refers to the mirror gap.

The claims require the condition illustrated in Fig. 8A, wherein the mirror gap, g_1, is less than the actuation gap, g_0. It is further required that the mirror gap be selected to produce controlled and stable displacement of the actuation region of a corresponding actuation element through a displacement range to a specified point in the actuation gap when a voltage is applied between an actuation region and a corresponding stationary electrode.

Ricco does not teach or suggest this claimed configuration. Referring, e.g., to Ricco Fig. 1, Fig. 3A, Fig. 7B, or other of the Ricco figures, in the Ricco configuration, there is provided a

single suspended beam 14 having flexible end regions 20 and an elongated central beam portion 18 having a mirrored surface. The end regions 20 are attached to a support frame 22. The beam 14 is suspended over a substrate 12 having stationary electrodes 16.

The distinctions of the grating element of the invention, as recited the claims and illustrated in Fig. 22, over the teaching of Ricco are clear. Ricco provides a single beam to be actuated and providing a mirror surface. Only one vertical gap is defined by Ricco, that gap being defined between the beam 14 and the substrate. In contrast, in the invention, as shown in Fig. 22 and recited in claim 1, distinct actuation and mirror gaps are defined by separate actuation elements and mirror elements - these cannot be one and the same element because it is required by the claims that the mirror gap be less than the actuation gap. Two separate beams and two separate gaps are required by the invention to enable the beam actuation shown in Fig. 8B and Fig. 22. Ricco in no way provides any suggestion of two gaps or two corresponding beams for enabling this actuation.

Thus, it is respectfully submitted that there is no correlation between Fig. 22 of the instant application and the teachings of the Ricco patent. Fig. 22 represents an embodiment of a grating element provided by the invention, and such is neither taught nor suggested by Ricco. Fig. 22 is not taken from or referring to the teaching of the Ricco patent in any way.

In the Office Action Summary, Examiner Addison appears to have inadvertently checked Box 13 to indicate that acknowledgement is made of a claim for foreign priority and that the certified copies of the priority documents have been received.

No claim for foreign priority has been made in the instant application. The instant application claims domestic priority under 35 U.S.C. §120 as a continuation application.

Examiner Addison is requested to provide a corrected acknowledgement of priority by checking Box 15 of the Office Action Summary page.

If the Examiner has any questions or needs additional information, she is encouraged to telephone the undersigned Agent at her convenience.

Date: May 14, 2003

Respectfully Submitted

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